Stiles, F. G. & Skutch, A. F. 1989. *A Guide to the Birds of Costa Rica*. Cornell Univ. Press.
Thurber, W. A., Serrano, J. F., Sermeño, A. & Benitez, M. 1987. Status of uncommon or previously unreported birds of El Salvador. *Proc. Western Foundation Vert. Zool.* 3: 109–293.
Wood, D. S. & Leberman, R. C. 1987. Results of the Carnegie Museum of Natural History expedition to Belize. III. Distributional notes on the birds of Belize. *Ann. Carnegie Mus.* 56: 137–160.
Wood, D. S., Leberman, R. C. & Weyer, D. 1986. Checklist of the birds of Belize. *Carnegie Mus. Nat. Hist. Special Publ.* 12.

Addresses: Steve N. G. Howell, Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, California 94970, USA. Barbara A. Dowell and Chandler S. Robbins, U.S. Fish and Wildlife Service, Patuxent Wildlife Research Center, Laurel, Maryland 20708, USA. Douglas A. James, Department of Biological Sciences, University of Arkansas, Fayetteville, Arkansas 72701, USA. Robert A. Behrstock, WINGS Inc., P.O. Box 31930, Tucson, Arizona 85751, USA.

Departure behaviour of night migrants in the eastern Sahara

by J. S. Ash

Received 9 January 1992

During an investigation in 1986 into the migration of Palearctic birds at Wadi Halfa (21°53′N, 31°19′E) in the northern Sudan, undertaken by an ICBP supported expedition in cooperation with the Wildlife Conservation Forces of the Sudan, I spent some time observing the departure of migrants on nocturnal flights. The chosen site was on the eastern shore of Lake Nasser on the River Nile's route through the Sahara, where areas of tamarisk *Tamarix* sp. scrub 1.5–2.0 m high are mostly not dense enough to be inaccessible on foot. As the waters of the lake rose in September this scrub became increasingly flooded.

Every day there were large numbers of migrants in the scrub. Most, if not all of them, arrived during the previous night from *c.* 24.00 h onwards, with a peak fall-out at *c.* 40 minutes before sunrise. They apparently spent the daylight hours in the scrub, and from the amount of activity seen, most, if not all of them, spent their time feeding or looking for food. A sample of over 6000 of the Palearctic migrants netted were ringed. Of these, 93% comprised three species, Reed Warblers *Acrocephalus scirpaceus* 59%, Lesser Whitethroats *Sylvia curruca* 24% and Sedge Warblers *A. schoenobaenus* 10%. All the migrants caught were in good condition and carried sufficient fat to enable them to complete the desert crossing (Nikolaus in prep.).

Around sunset (at 17.56 h on 15 September) there was either marked reduction in activity among the migrants, or else they became less visible, and at first it was thought that this was perhaps due to their departure on migratory flight. Further investigation, however, revealed that the birds were still present but in a relatively inactive or quiescent state. At 34–57 minutes after sunset they departed individually in rapid ascent into the

sky. During this one hour period after sunset no birds were caught in nets erected in the scrub, indicating that apparently no birds were moving about in near-horizontal flight.

When some of the above migrants were followed in the evenings a type of behaviour more or less common to them all was observed, which I had neither seen previously nor had seen referred to anywhere. As this behaviour is presumably linked with departure on migratory flights the following brief accounts of each incident are related to the time of sunset. Sunset was at *c.* 18.00 h local time, and all incidents detailed below are described as occurring so many minutes after sunset. With sunset at 18.02 h, an incident at 18.12 h is referred to as at +10. At this latitude there were only 30–40 minutes between sunset and darkness, so that birds low down in vegetation soon disappeared from view. By adjusting my position it was sometimes possible to place a bird in silhouette against the paler post-sunset area of the sky, or against this light reflected from water.

(1) 15 September. A Reed Warbler watched from about sunset departed at +39 by flying straight up into the air without any indication of direction.

(2) 16 September. After losing sight of several birds, two Reed Warblers and a Lesser Whitethroat were found at +19, still feeding actively in low tamarisks standing in water. They soon settled down and commenced to preen, which they continued to do until +29. They then all moved down to within 30 cm of the water, where the Reed Warbler stretched both wings, but otherwise did not move, while the other two birds were lost in the increasing darkness. At +43 the Reed Warbler suddenly darted off at an angle of 45° and was almost immediately lost in the dusk. While under observation it was noticeable that this bird, like the others, was very much aware of any passing birds, mostly Swallows *Hirundo rustica* and Egyptian Geese *Alopochen aegyptiaca*. At the time there was a $\frac{3}{4}$ moon, light NW breeze and $\frac{9}{10}$ cloud.

(3) 17 September. The first bird, a Spotted Flycatcher *Muscicapa striata*, was still feeding when lost to view in very poor light at +22. At the same time an immobile Sedge Warbler was found which remained in that state until +32, when it flew off to another bush and was lost. While scanning this bush and others nearby five motionless birds, almost certainly Reed Warblers, were found sitting together in a small tamarisk. Three of these flew off at +42, +52 and +57, all towards the north, and one of them, seen well against an area of pale sky in the west, was visible for some distance rising at 30°. At +42 another observer, Thomas Kiel, who was moonwatching several hundred metres away saw a small bird rise rather erratically into the air across the face of the moon.

(4) 18 September. After a search in which no suitable birds could be found four motionless Reed Warblers were seen together in the same low tamarisk bush. They left singly at +34, +35, +37 and +39 flying off in an erratic manner to the NW (2), SW and W, at an angle of 45° over the lake. During this observation *c.* 40 Swallows settled in a nearby bush, and at least two of them flew off at +36 and +38.

A week later at a desert site at a distance of *c.* 30 km from the lake and river a further incident occurred which may not be related to those described above, although it did concern a Palearctic migrant.

(5) 24 September. At about an hour before sunset a Rüppell's Warbler *Sylvia rueppelli* was found feeding actively in a very small group of sparse low bushes in the desert at 30 km WSW of Teita on the Nile at 18°47'N, 30°07'E. No other birds were present. On returning at sunset to search for a migrant preparing to depart I found what was presumably the same Rüppell's Warbler in a most curious posture. It was perched completely stationary at 30 cm above ground level on an exposed twig with its bill held almost vertically overhead, in which state it remained until +15. Returning at +60 with Gerhard Nikolaus we found the bird in exactly the same site and posture when it was easily hand-caught with the aid of a flashlight. Five minutes later it was placed in a small acacia bush, but 1.2 h later there was no sign of it. At dawn we made a thorough search, so detailed that there was no possibility of missing the bird either dead or alive. As it could not be found it had presumably left in the night.

Discussion

It is not known to what extent the birds watched in the evening had been feeding during the day. Presumably some food was available for them, and water for drinking or bathing was plentiful. At a time shortly after sunset a non-migrating bird would be settling down to rest and adopting its normal sleeping posture. The birds observed here were not doing this: after it was too dark to feed they presumably conserved energy by resting, although they occasionally stretched and preened. In general their behaviour gave the impression that they were preparing for activity rather than rest. It was quite clear from slight head movements that they were aware of passing birds, and any other avian activity in their immediate vicinity. Obviously it is important that departing migrants need to be aware of the presence of potential predators, for some species, such as Sooty Falcons *Falco concolor*, will concentrate on capturing departing migrants as they take off at late dusk (pers. obs. in Egypt). There must be high survival value in delaying departure until the cover of darkness conceals them from predators, and the departure of migrants in rapid darting flight at Wadi Halfa could help in avoiding attacking predators. However, another reason for delaying departure could be the need to await the appearance in darkness of visible navigation aids such as the moon and stars.

In general trans-Saharan migrants under good conditions are carrying enough fuel for a desert crossing. If adverse conditions arise at any stage the birds are faced with a situation where they either have to conserve energy for onward flight, or use up some of their reserves in a search for an extra source of energy. At one extreme, migrants in total desert without sustenance will remain almost motionless in the shadow of a stone or plant all day, whereas at the other extreme, such as at Wadi Halfa, birds may be able to maintain their fuel resources by feeding during the day, may be able to restore any recent losses, and perhaps even boost their arrival weights.

It is suggested here that the migrants at Wadi Halfa arrive in good condition in a vegetated area, perhaps detected by scent, where they remain in a stress-free situation to feed during the day, and then depart on

a following evening. An analysis of the weights of these birds now being undertaken (Nikolaus, in prep.) could provide clues about their energy requirements and fuel consumption, in relation to the journey already taken and for that which lies ahead. Evening departure times at 34–57 minutes after sunset at Wadi Halfa conform with times found by several other observers in north Africa and the eastern Mediterranean summarized in Biebach *et al.* (1991) as 30–90 minutes after sunset. However, birds departing after +60 would not be visible at Wadi Halfa. Other aspects of our 1986 observations in relation to those in Biebach *et al.* (*loc. cit.*) are being discussed elsewhere.

Acknowledgements

This study was undertaken incidentally to the main objectives of the ICBP Wadi Halfa Expedition in 1986. I extend thanks to: Gerhard Nikolaus, the International Council for Bird Preservation (ICBP), the Wildlife Conservation Forces of the Sudan and Deutscher Bund für Vogelschutz (DBU).

References:

Biebach, H., Friedrich, W., Heine, G., Jenni, L., Jenni-Eiermann, S. & Schmidl, D. 1991. The daily pattern of bird migration in the northern Sahara. *Ibis* 133: 414–422.

Nikolaus, G. In prep. Autumn migration of Palearctic birds in the eastern Sahara.

Address: Dr J. S. Ash, Godshill Wood, Fordingbridge, Hants. SP6 2LR, U.K.

Northern White-tailed Bush Lark *Mirafra albicauda*, Singing Bush Lark *M. cantillans* and Friedmann's Bush Lark *M. pulpa* in Ethiopia

by J. S. Ash

Received 9 January 1992

There has been some confusion over the occurrence and distribution of certain *Mirafra* larks in Ethiopia, notably the Northern White-tailed Bush Lark *M. albicauda*, the Singing Bush Lark *M. (javanica) cantillans* and Friedmann's Bush Lark *M. pulpa*. The following remarks attempt to clarify the situation.

Records of Mirafra albicauda

Benson (1946) collected four larks in southern Ethiopia which he presented to the British Museum (Natural History) identified as *Mirafra albicauda*. These birds were apparently never referred to in the literature as *M. albicauda*, except by Benson himself (*loc. cit.*); at a later date Benson reidentified these birds as *M. cantillans marginata*, and the names on their labels were corrected. Prior to Benson's records above of *albicauda* the Childs Frick Expedition to Ethiopia collected four specimens (Friedmann 1937) in March 1912 (Appendix) in an area of black cotton soil at the